REMARKS

The specification and claims have been amended in a sincere attempt to place the case in condition for allowance.

The Examiner observed it was not clear what was being stated at page 24, line 24. The paragraph has been amended striking the confusing terms. The paragraph is now believed to be readily understandable.

Claim 1 was objected to because the specification at page 16, line 7 referred to an undercoat layer rather than to a primer layer functioning as a stress relaxing layer. The appropriate paragraph at page 16 has been amended to indicate that the undercoat layer may also be called a primer layer. It is therefore believed that claim 1 is consistent with the description in the specification. If the Examiner wants this matter treated in a different way, she is asked to contact the undersigned.

The objection to the specification under the first paragraph of 35 USC 112 is acknowledged. We are informed that applicants are providing an English translation of the foreign standard (Japanese Industrial Standard) test mentioned at page 7, lines 30 to 34 of the specification. That document will be submitted upon receipt. The related rejection of claim 22 under the first paragraph of 35 USC 112 is noted. It is believed that rejection will be rendered

moot upon submission of the English translation of the JIS directed to the moisture permeability test.

Claims 26 to 28 were rejected under the second paragraph of 35 USC 112 because of the presence of "and/or." The term has been stricken from those claims and new claims 36 to 41 have been added directed to other embodiments originally covered by but no longer within the scope of claims 26 to 28 following the changes thereto. Applicants respectfully submit that the scope of claims 26 to 28 as filed is clear; as the Examiner acknowledged, the claims embraced "three different combinations." The claim changes were made to advance prosecution.

The rejection of claims 1 to 6 and 16 to 35 under 35 USC 103 as unpatentable over Manning et al. '007 in view of Takahashi et al. '44, if applied to the claims as amended, is respectfully traversed. (Because claim 30 depends from claim 7, it is believed that claim 30 more properly belongs in the group of claims involved in the second art rejection in the Office Action.) Claims 7, 16, and 21 have been amended to recite that respectively the penetration-inhibiting coating, the sealer layer, and the first and second sealer layers function as stress relaxing layers for relaxing shrinkage stress caused at the time of curing of the ionizing radiation-curable resin for the formation of the top coat. The claims, where appropriate, have also been amended to specify

that the top coat is formed of an ionizing radiation cured resin composition. Minor changes have been made in claims 14 and 19; claims 13 and 23 have been canceled because their features now appear in claims 7 and 21, respectively.

The present invention is directed to a decorative material in various embodiments (see independent claims 1, 7, 16, and 21) characterized by excellent resistance to staining and presenting no failure-of-adhesion problems. In each embodiment, at least one designated layer in the decorative material serves as a layer to relax stress caused during formation of an ionizing radiation-cured resin from an ionizing radiation-curable resin. The cured resin serves as a protective layer or top coat, depending upon the particular embodiment; again, see claims 1, 7, 16, and 21 as they now read. Applicants respectfully submit that the references do not teach or suggest this claimed concept.

The Examiner provides a detailed analysis and description of the primary reference at pages 4 to 6 of the Office Action. The Examiner asserts that all of the features of the instant claims save the addition of fillers and additives are shown in the primary reference and Takahashi et al. '044 is asserted to show the known use of such materials, e.g., alpha-alumina spherical particles. Applicants respectfully disagree and submit that the references in combination do not teach or suggest the features of the instantly

claimed invention. The instant claims, as discussed above, require the top coat or protective layer to be formed of an ionizing radiation-cured resin. The discussion in Manning et al. '007 directed to an overcoat or wear layer at column 10 for the underprinted inlaid sheet of the reference, which is primarily useful for floor covering, in no proper way teaches or suggests this compositional makeup of the top coat or protective layer of applicants' invention. The reference considered either by itself or in combination with the secondary reference does not teach or suggest an intermediate layer functioning as a stress relaxing layer when curing of the ionizing radiation-curable resin occurs. Because Manning et al. '007 does not specify an ionizing radiation-cured resin serving as the top coat or protective layer of the laminate of the reference, one of ordinary skill in the art would not be directed from such a teaching to make certain that the laminate includes also an intermediate layer for relaxing stress caused by the curing of an ionizing radiation-curable resin to an ionizing radiation-cured resin serving as a protective layer or top coat of the laminate.

The Examiner is also directed to the specification beginning at page 73 for working and comparative examples (with tables) establishing the patentability of the claimed subject matter. Manning et al. '007 does not teach or suggest an essential aspect

of the claimed invention; the secondary reference does not overcome (and has not been cited to overcome) this deficiency. The record, moreover, contains evidence of patentability. The rejection should be withdrawn.

The rejection of claims 7 to 15 under 35 USC 103 as unpatentable over Sato et al. '457 in view of Takahashi et al. '044 is also respectfully traversed. Claim 30 should be included for this claim group for the reasons given above.

In this embodiment of the invention, the decorative material has a penetration-inhibiting coating which also functions as a stress relaxing layer to relax shrinkage stress caused at the time of curing of the ionizing radiation-curable resin for formation of the top coat.

Sato et al. '457 describes a printed decorative paper in laminate form having concavities. The reference is absolutely silent about having (1) a top coat formed of an ionizing radiation-cured resin and (2) a substrate coating both for inhibiting the penetration of an ionizing radiation-curable composition and for relaxing stress when the ionizing radiation-curable resin is cured. Nor is such a teaching found in the secondary reference.

The Examiner is again directed to the working and comparative examples in this application wherein it is clear that the decorative material in accordance with the claims has properties

and characteristics not shown in related products. The Examiner is referred particularly to pages 99 to 101. The rejection should be withdrawn.

The Examiner is thanked for acknowledging receipt of the certified copies of the priority documents and for citing the references provided in an Information Disclosure Statement.

In view of the foregoing revisions and remarks, it is respectfully submitted that claims 1 to 12, 14 to 22, and 24 to 41 are in condition for allowance and a USPTO paper to those ends is earnestly solicited.

The Examiner is requested to telephone the undersigned if additional changes are required in the case prior to allowance.

Respectfully submitted,

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(meth)acrylate-butyl (meth)acrylate copolymer, ethylene-methyl (meth)acrylate copolymer, and styrene-methyl (meth)acrylate copolymer.

At least one acrylic resin selected from the above acrylic resins is mixed with nitrocellulose, and the mixture is used for the ink layer. or primer layer

7 An under coat 4 is provided for relaxing shrinkage at the time of curing of an ionizing radiation-curable resin layer for the formation of the ionizing radiation-cured resin layer 5. The under coat 4 may be formed of acrylic resin, vinyl chloride-vinyl acetate copolymer, polyester resin, urethane resin, butyral resin, 13 chlorinated polypropylene, or chlorinated polyethylene.

When the under coat 4 is formed of a resin layer composed mainly of an acrylic resin, acrylic resins usable herein include those used in the acryl nitrocellulosic ink, for example, acrylic resins (the term "(meth)acryl" used herein referring to acryl or methacryl; the same shall apply hereinafter) which are homopolymers or copolymers containing an (meth)acrylic ester, such as polymethyl (meth)acrylate, polyethyl (meth)acrylate, polypropyl (meth)acrylate, polybutyl (meth)acrylate, methyl (meth)acrylate-butyl (meth)acrylate copolymer, ethyl (meth)acrylate-butyl (meth)acrylate copolymer, ethylene-methyl (meth)acrylate copolymer, and styrene-methyl (meth)acrylate copolymer.

A urethane resin may also be used for forming the under coat 4. The urethane resin may be a polyurethane comprising a polyol (a polyhydric alcohol) as a main agent and an isocyanate as a crosslinking agent (a curing agent). Polyols usable herein include those having two or more hydroxyl groups in the molecule thereof, for example, polyethylene glycol, polypropylene glycol, acrylpolyol, polyester polyol, and polyether polyol. Isocyanates usable herein include those having two or more isocyanate groups in the molecule thereof, for example, polyisocyanate, aromatic isocyanate, such

higher than the resin cured by crosslinking. Inorganic particles or organic resin particles may be used as the spherical particles. However, inorganic particles are recommended from the viewpoint of abrasion resistance and hardness. The difference in hardness between the spherical particles and the resin cured by crosslinking may be measured, for example, by the Mohs hardness, Vickers hardness or other method, and is preferably not less than 1 in terms of Mohs hardness.

Specific examples of materials for spherical particles include inorganic particles of α-alumina, silica, chromium oxide, iron oxide, diamond, graphite and the like, and organic resin particles, such as beads of synthetic resins, such as crosslinked acrylic resins. Particularly preferred spherical particles are spherical α-alumina, for example, from the viewpoint of very high hardness, high effect of abrasion resistance, and relatively good availability of spheres.

The spherical particles may be in any shape so far as the surface is surrounded by a smooth curve, and examples of shapes include truly spherical shapes, ellipsoids of revolution in a flattened sphere form, shapes close to true spheres, and shapes close to ellipsoids of revolution. Preferably, the spherical particles are free from protrusions, corners, valleys, or concaves particularly on the surface of particles. The spherical particles, as compared with particles, having irregular shapes, of the same material, can advantageously significantly improve the abrasion resistance of the surface resin layer per se, does not abrade a coating device, and, even after the curing of the coating, does not abrade other materials, which come into contact with the coating, and, in addition, can provide higher transparency of the coating. Spherical particles having smooth shapes can improve the effect.

In the present embodiment, particularly the resin constituting the ionizing radiation-cured resin layer 5

preferably has an average molecular weight between crosslinks of not less than 100 and not more than 200. When the average molecular weight between crosslinks falls within this range, in a test on resistance to staining, any contaminant is not left on the surface of the layer, and the surface of the layer exhibits good resistance to staining. According to the present embodiment, in curing the ionizing radiation-curable resin layer to form the ionizing radiation-cured resin layer 5, the under coat 4 relaxes shrinkage caused in the course of curing of the resin layer. This can prevent the surface of the print layer 3 from being directly broken. Primarily, when the average molecular weight between crosslinks is not more than 200, the crosslinking reaction strongly [act] acts in the layer, leading to significant shrinkage. However, the under coat 4 functions to scatter the force created by shrinkage and thus can prevent the print layer 3 from being broken. The average molecular weight between crosslinks of the resin constituting the ionizing radiation-cured resin layer 5 may be determined by dividing the molecular weight of the whole resin by the number of crosslink points (see the numerical formula described above). In this case, the molecular weight of the whole resin is Σ (number of moles of each component incorporated x molecular weight of each component), and the number of crosslink points is Σ [1(number of functional groups in each component - 1) x [21] 2 x number of moles of each component].

The ionizing radiation-cured resin layer 5 may contain an ionizing radiation-noncurable resin so far as the resistance to staining is not sacrificed. Ionizing radiation-noncurable resins usable herein include thermoplastic resins, such as urethane, cellulosic, polyester, acrylic, butyral, polyvinyl chloride, polyvinyl acetate and other thermoplastic resins. Among them, cellulosic, urethane, and butyral thermoplastic

composition is coated directly on the surface of the substrate sheet, or by a transfer coating method wherein an ionizing radiation-curable resin layer is previously formed on the surface of a releasable substrate followed by transfer of the ionizing radiation-curable resin layer onto the surface of the substrate sheet. When a decorative paper is used as the substrate sheet, any of the direct coating method and the transfer coating method may be used if a base paper for the decorative paper is formed of a material into which the coating composition cannot penetrate. On the other hand, the use of the transfer coating method is preferred when the base paper for the decorative paper is penetrable with the coating composition, when the substrate has surface irregularities, when an even coating thickness is contemplated, or when the provision of uniform abrasion resistance is contemplated by using uniform intensity of the ionizing radiation.

Direct coating methods usable herein include gravure coating, gravure reverse coating, gravure offset coating, spinner coating, roll coating, reverse roll coating, kiss coating, whirler coating, dip coating, solid coating using silk screen, wire bar coating, flow coating, [Komma cïöÖK„DnÖ÷ý‹¦"Âð{ ùHor] spray coating or the like. Among them, gravure coating is preferred.

The transfer coating method may utilize the following means (a) to (d). Specifically, for example, use may be made of a lamination method (a, b) wherein a coating is once formed on a thin sheet (film) substrate and then cured by crosslinking followed by covering on the surface of a substrate or wherein a coating of a coating composition, together with a substrate, is adhered to a three-dimensional object, and a transfer method (c) wherein a transfer sheet formed by once forming a coating and optionally an adhesive layer on a releasable support sheet and curing the coating by

MARK UP

(Amended)

7. A decorative material comprising:

a substrate penetrable with an ionizing radiation-curable resin composition;

a penetration-inhibiting coating provided on the substrate, for inhibiting the penetration of the ionizing radiation-curable resin composition;

a cissing pattern provided on the penetration-inhibiting coating, for repelling the ionizing radiation-curable resin composition; and

a top coat provided on the penetration-inhibiting coating including the cissing pattern, the top coat comprising an ionizing radiation-cured resin composition, concaves being defined by the top coat, the concaves having been formed as a result of cissing of the ionizing radiation-curable resin composition from on the cissing pattern in the course of the formation of the top coat from the ionizing radiation-curable resin composition.

, said penetration-inhibiting coating also functioning as a stress-relaxing layer for relaxing shrinkage stress caused at the time of curing of the ionizing radiation-curable resin for the formation of the top coat

(amended) 1

14. The decorative material according to claim [13], wherein the penetration-inhibiting coating has a yield strength of not less than 0.6 kgf and a breaking strength of not less than 1.0 kgf, the yield strength and the breaking strength having been measured in such a manner that two biaxially stretched polyethylene terephthalate film strips having a thickness of 50 μm and a width of 10 mm are laminated on top of the other through a 3 μm-thick [primer layer] so as for the end of one of the strips to overlap with the end of the other strip by 10 mm and, in this state, the two biaxially stretched polyethylene terephthalate film strips are pulled at a temperature of 70℃ in opposite directions.

Penetration-inhibiting Coating

(Amended)

16. A decorative material comprising:

a substrate formed of paper;

a print layer provided on the substrate;

a sealer layer provided on the print layer; and

a top coat provided on the sealer layer, the top coat comprising [a crosslinked resin] an ionizing radiation-curable resin,

the top coat being regulated to a coefficient of dynamic friction of 0.3 to 0.6 in the gloss (75 degrees) range of 10 to 50, said sealer layer also functioning as a stress-relaxing layer for relaxing shrinkage stress caused at the time of curing of the ionizing radiation-curable resin for the formation of the top coat.

(Amended)

19. The decorative material according to claim 16, wherein the sealer layer has a yield strength of not less than 0.6 kgf and a breaking strength of not less than 1.0 kgf, the yield strength and the breaking strength having been measured in such a manner that two biaxially stretched polyethylene terephthalate film strips having a thickness of 50 μm and a width of 10 mm are laminated on top of the other through a 3 μm-thick [primer] sealer layer so as for the end of one of the strips to overlap with the end of the other strip by 10 mm and, in this state, the two biaxially stretched polyethylene terephthalate film strips are pulled at a temperature of 70℃ in opposite directions.

(Amended)

21. A decorative material comprising:

a substrate formed of paper;

a first sealer layer provided on the substrate;

a print layer provided on the first sealer layer;

a second sealer layer provided on the print layer; and

a top coat provided on the second sealer layer, the top coat comprising [a crosslinked resin] an ionizing radiation-curable resin,

the total thickness of the layers being not more than 50 μm, said first and second sealer layers also functioning as a stress-relaxing layer for relaxing shrinkage stress caused at the time of curing of the ionizing radiation-curable resin for the formation of the top coat.

(Amended)

~~wherein the topcoat contains a hydrophobic silica.~~

26. The decorative material according to claim 21, wherein the first sealer layer [and/or the second sealer layer comprise] a crosslinked resin.

(Amended) Comprises

27. The decorative material according to claim 21, wherein the first sealer layer [and/or the second sealer layer have] The a yield strength of not less than 0.6 kgf and a breaking strength of not less than 1.0 kgf, the yield strength and the breaking strength having been measured in such a manner that two biaxially stretched polyethylene terephthalate film strips having a thickness of 50 μm and a width of 10 mm are laminated on top of the other through a 3 μm-thick [primer] sealer layer so as for the end of one of the strips to overlap with the end of the other strip by 10 mm and, in this state, the two biaxially stretched polyethylene terephthalate film strips are pulled at a temperature of 70℃ in opposite directions.

(Amended)

28. The decorative material according to claim 21, wherein the first sealer layer [and/or the second sealer layer have] The a yield strength of 0.6 to 3.0 kgf and a breaking strength of 1.0 to 4.0 kgf.

29. The decorative material according to claim 1, wherein the protective layer has a maximum temperature, at which the protective layer can withstand, of 170℃.

30. The decorative material according to claim 7, 16 or 21, wherein the top coat has a maximum temperature, at which the protective layer can withstand, of 170℃.

31. The decorative material according to claim 29 or 30, wherein the decorative material has a surface gloss of not less than 90 as measured with a Gardner 75-degree gloss meter.

32. The decorative material according to claim 1, wherein the print layer comprises a pattern having lower air permeability than the other portions and has, on its whole surface, the protective layer.

33. The decorative material according to claim 32,